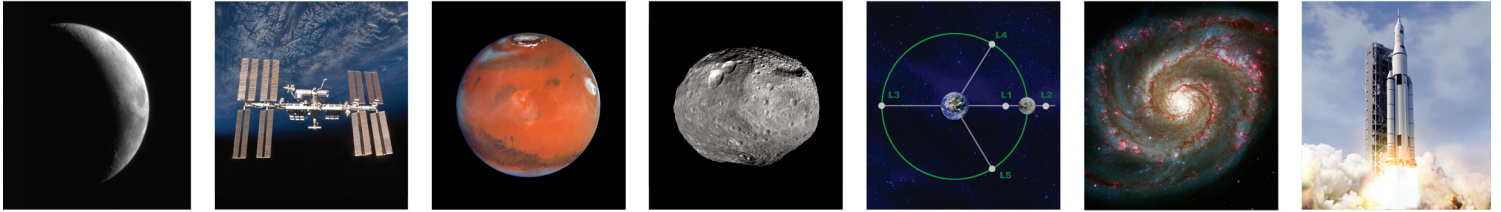




# Space Launch System

## Highlights

February 2013

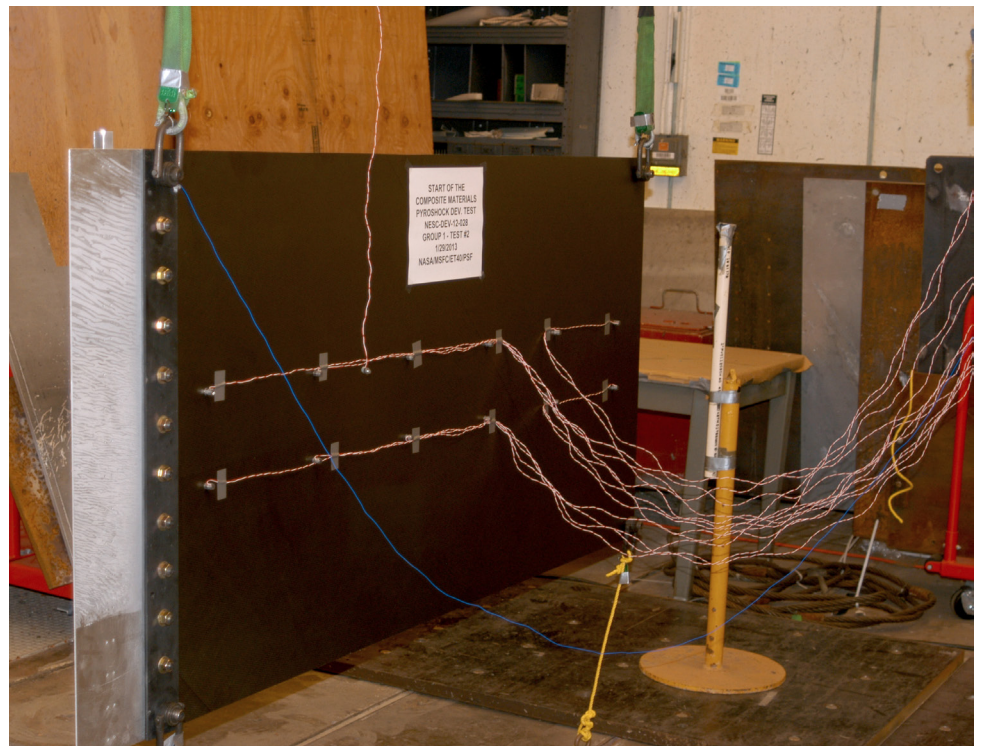


## SLS Conducts Explosive Tests of New Materials

NASA engineers are researching new composite materials to incorporate into designs for the evolved Space Launch System (SLS) rocket to make a more secure vehicle from lighter materials than more traditional metals. Before these designs can be flown, engineers must ensure the composite can withstand the stresses of a launch.

To help gain that confidence, the SLS Advanced Development Office at NASA's Marshall Space Flight Center in Huntsville, Ala., is conducting a series of composite material pyroshock tests. In the tests, an explosive charge is placed on a metal plate affixed to a composite material panel. When the charge is ignited, a shockwave is sent through the composite panel.

Engineers are studying the results to examine the possibility of using a variety of composites in the future and are creating a model to predict how panels withstand launch stresses and shock loads.



(Image: NASA/MSFC)

During launch, explosive charges are used to separate sections of the vehicle, and the results of this testing at Marshall will help engineers design structures to optimally withstand the resulting shockwaves. The test program is one of several research efforts the Advanced Development Office is conducting to find innovative ways to make the SLS a state-of-the-art rocket, as NASA matures its design of a vehicle capable of lifting 130 metric tons (143 tons).

## Spaceflight Partners: L-3 Cincinnati Electronics

*EDITOR'S NOTE: Every month, SLS Highlights turns the spotlight on one of the industry partners helping to create the largest rocket ever built for human space exploration. In this issue, we profile L-3 Cincinnati Electronics Corp., of Mason, Ohio, just northeast of Cincinnati.*

L-3 Cincinnati Electronics (CE) is an established pioneer in space exploration and military/defense technology. CE is known for its expertise in the areas of infrared detection and space and missile electronics. As an engineering and production company, CE is engaged in the design, development, and manufacture of highly sophisticated electronics equipment in a variety of product areas for government, civil, and commercial applications.

For the Space Launch System, the company is working closely with the prime contractor for the solid rocket boosters, ATK of Promontory, Utah. CE is providing 20 sets of avionics hardware, or 10 for each booster. The company also is providing



(Image: L-3 Corp.)

seven sets of avionics for the core stage, built by The Boeing Co. of Huntsville, Ala. The company's Space Electronics Business Unit provides critical avionics and communication products for satellites and launch vehicles, including test beds on the International Space Station and the Mars orbiters, landers, and rovers.

## NASA Awards Final SLS Advanced Booster Contract

NASA has selected Aerojet of Sacramento, Calif., for a \$23.3 million contract to develop engineering demonstrations and risk reduction concepts for future advanced boosters for the Space Launch System.

The initial 70-metric-ton (77-ton) configuration of SLS will use two five-segment solid rocket boosters similar to the boosters that helped power the space shuttle to orbit. An evolved 130-metric-ton (143-ton) rocket will require an advanced booster with more thrust than any currently existing U.S. liquid- or solid-fueled boosters.

Aerojet is one of four companies contracted under a NASA Research Announcement (NRA) to improve the affordability, reliability, and performance of an advanced booster for a future version of the SLS heavy-lift rocket. The other companies under contract include ATK Launch Systems, Inc. of Promontory, Utah; Dynetics, Inc. of Huntsville, Ala.; and Northrop Grumman Corporation Aerospace Systems of Redondo Beach, Calif. These new initiatives will perform and examine advanced booster concepts and hardware demonstrations during an approximate 30-month period.

Aerojet will work to reduce the risk and improve technical maturation of a liquid oxygen and kerosene oxidizer-rich staged-combustion engine. The company will fabricate a representative full-scale, 550,000-pound thrust-class main injector and thrust chamber, and conduct a number of tests measuring performance and demonstrating combustion stability.



# SLS Facility Modifications March Forward

Modifications to NASA's Michoud Assembly Facility in New Orleans continue in support of requirements for NASA's Space Launch System. Multiple projects, facility modifications, and new construction have started and will continue through 2014.

In the space of a week, what started out as an empty floor in one of the buildings has grown into a circle of steel monuments and control boxes dedicated to fabricating L and Y rings for the SLS rocket. These rings are used to make barrel-to-barrel and dome-to-barrel connections within the SLS rocket's structure. The tooling installation work should wrap up in March with test and checkout procedures immediately following it.



Site preparations are being made for the installation of the Vertical Assembly Center (VAC). The VAC is where dome assemblies and the tank barrel sections will be joined together to complete the tanks or dry structure assemblies. The VAC also will perform nondestructive evaluation on the completed welds. The work on the facility is scheduled for completion in March 2014. *(Image: NASA/MAF)*

Scheduled for completion by May, the Enhanced Robotic Weld Tool will make dome components for SLS. Different weld tooling installed in a high-bay manufacturing building will be used to make the SLS barrel components. Known as the Vertical Weld Center, the friction-stir-weld tool will stand about three stories tall once fully assembled in June.

One of the Michoud buildings will undergo major modifications, as the roofline will be extended to accommodate the large rocket. This requires breaking up the tarmac in front of the building and adding to the existing foundation.

## New Round of J-2X Testing Under Way



NASA engineers conducted the first in a new round of tests on the next-generation J-2X rocket engine Feb. 15 at NASA's Stennis Space Center in Mississippi. The 35-second test continued progress in development of the engine that will provide upper-stage power for the Space Launch System, which will enable missions farther into space than ever. The image at left is from the Feb. 27 test—a full-duration 550-second test. The video is available [here](#). The new round of tests on J-2X engine number 10002 on the A-2 Test Stand at Stennis will provide critical performance data for the engine. Once the series is completed, the engine will be transferred to the A-1 Test Stand at Stennis to undergo a series of gimbal (or pivot) tests for the first time. The J-2X engine is the first human-rated liquid oxygen and liquid hydrogen engine developed in the United States in decades. It is being designed and built by NASA and partner Pratt & Whitney Rocketdyne of Canoga Park, Calif. *(Image: NASA/SSC)*

# SLS On the Road...

College students at Tennessee Tech University in Cookeville, Tenn., learn more about SLS at the debut of the new traveling SLS exhibit at the university's Millard Oakley STEM Center. The exhibit was unveiled as part of Tennessee Tech's "Engineers' Week" activities, which included panel discussions, career fairs, and hands-on activities for college and grade school students.

(Image: NASA/MSFC)



For more SLS news, updates and resources, visit [www.nasa.gov/sls](http://www.nasa.gov/sls)

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From left, NASA Administrator Charles Bolden is joined by Marshall Space Flight Center Director Patrick Scheuermann; Frank Ledbetter, chief of the non-metallic materials and manufacturing division at Marshall; and Andy Hardin, NASA's Space Launch System subsystem manager for liquid engines. Bolden toured the National Center for Advanced Manufacturing Rapid Prototyping Facility at Marshall on Feb. 22. During the visit, Bolden saw firsthand how NASA is using a high-tech 3D printing process called selective laser melting to create intricate metal parts for America's next heavy-lift rocket. (Image: NASA/MSFC)

## SLS on Deck:

- SLS Boosters Preliminary Design Review
- Progress on Spacecraft & Payload Integration

